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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/818,304	03/27/2001	Kyu Takada	15162/03140	1657

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SIDLEY AUSTIN BROWN & WOOD LLP
717 NORTH HARWOOD
SUITE 3400
DALLAS, TX 75201

EXAMINER	
MARTINEZ, JOSEPH P	

ART UNIT	PAPER NUMBER
2873	

DATE MAILED: 09/11/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No.	Applicant(s)
	09/818,304	TAKADA, KYU
	Examiner	Art Unit
	Joseph Martinez	2873

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 June 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The spacing of the lines of the specification is such as to make reading and entry of amendments difficult. New application papers with lines double spaced on good quality paper are required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 4-6 and 10-18 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Reber.

Referring to claims 4, 10, 13 and 16, Reber teaches for example, a product by the method of manufacturing or the method of manufacturing, which provides as depicted in FIG. 1a, a semiconductor substrate 10, here silicon is shown, having formed on one major surface 12 (the front surface) thereof a coating 14. A coating 16 may optionally be provided on the back major surface 18 for aesthetic purposes (column 3 lines 15-19). The coating 14 (and 16) comprises any

material that is capable of being patterned to micrometer and submicrometer dimensions so as to diffract incident light. Exemplary of such materials are metals, such as gold, aluminum, silver, titanium, nickel, tantalum and the like, and dielectrics such as oxides, particularly inorganic oxides such as silicon dioxide, and photoresists. The material may be reflective, such as a metal as described above so as to provide an additional decorative effect arising from the presence of the metal itself, or the material may be transparent, so long as it may be suitably patterned as described above (column 3, lines 27-37). Next, the coating is patterned, employing conventional lithographic techniques. While many such techniques are available, electron beam lithography is preferred because it is capable of generating the requisite pattern dimensions. Electron beam technology permits the pattern generation of a mask, using an e-beam resist. The mask is then employed in conjunction with a conventional photoresist layer on the substrate coating to be patterned, with exposure of the masked photoresist, for example, to optical radiation incrementally stepped across the resist-coated wafer. Alternatively, e-beam technology permits the use of direct-writing the desired pattern in the substrate coating (column 3, lines 52-64). Continuing in the description of the process of fabricating the decorative article of manufacture of the invention employing the mask approach, a photoresist layer 20 is deposited on the coating 14, as shown in FIG. 1a. A positive photoresist, such as Shipley AZ 1350, may be employed, since in such materials, regions exposed to actinic radiation to form the pattern are cross-linked (polymerized) relative to unexposed regions. However, negative resists may also be suitably employed in the practice of the invention. A reticle (not shown) containing the desired pattern is used in the direct step on wafer process to provide regions in the photoresist layer 20 which replicate regions in the reticle. Following exposure to actinic radiation, exposed regions are then

removed, such as by a wet process (chemical etching) or a dry process (plasma etching). The removed regions thereby expose underlying portions of the coating 14 through openings 22, shown in FIG. 1b. The exposed portions of the coating 14 are then etched, either chemically, such as with an appropriate acid (metal coating) or solvent (photoresist coating), or with plasma, to generate a relief pattern. The etching advantageously removes material all the way to the surface 12 of the substrate 10, further extending the openings 22, as shown in FIG. 1c. Alternatively, the etching may remove only a portion of the exposed regions, so long as the openings are of sufficient depth such that, in conjunction with the width of the lines 26 thus produced, the relief is of sufficient dimension so as to provide diffraction of incident light. The remaining photoresist layer employed in the lithographic process is removed with a suitable solvent, leaving a patterned series of lines 26 in the coating 14, as seen in cross-section in FIG. 1d and in plan view in FIG. 2 (columns 4-5, lines 43-68 and 1-13). Alternatively, the photoresist layer 20 may be deposited directly on the substrate 10 and patterned as above to form openings 22. The coating 14 may then be deposited over the entire photoresist layer, including the openings 22. Then, employing well-known "lift-off" techniques, the photoresist may be removed, taking with it the coating filling the openings, thereby providing the patterned coating on the substrate (column 5, lines 14-22). A transparent layer 28 is then deposited over at least the patterned coating 14 on the substrate 10, as shown in FIG. 1d, to form the finished product. Such a layer must be durable in order to protect the underlying coating 14 against scratches, abrasion, etc., and may comprise a transparent oxide, such as silicon dioxide or silica-based glass, or a transparent plastic, such as a polyurethane or a polyimide. The deposition of such

materials is well-known (column 6, lines 1-9). The layer 28 is substantially transparent, in order to permit the maximum diffraction effect to be perceived (column 6, lines 16-18).

Referring to claim 5, 11, 14 and 17, Reber further teaches for example, the use of different mediums such as the coating 14 (and 16) comprises any material that is capable of being patterned to micrometer and submicrometer dimensions so as to diffract incident light. Exemplary of such materials are metals, such as gold, aluminum, silver, titanium, nickel, tantalum and the like, and dielectrics such as oxides, particularly inorganic oxides such as silicon dioxide, and photoresists. The material may be reflective, such as a metal as described above so as to provide an additional decorative effect arising from the presence of the metal itself, or the material may be transparent, so long as it may be suitably patterned as described above (column 3, lines 27-37). Also, a transparent layer 28 is then deposited over at least the patterned coating 14 on the substrate 10, as shown in FIG. 1d, to form the finished product. Such a layer must be durable in order to protect the underlying coating 14 against scratches, abrasion, etc., and may comprise a transparent oxide, such as silicon dioxide or silica-based glass, or a transparent plastic, such as a polyurethane or a polyimide. The deposition of such materials is well-known (column 6, lines 1-9). The layer 28 is substantially transparent, in order to permit the maximum diffraction effect to be perceived (column 6, lines 16-18). It is fundamental that the different materials possess different indices of refraction because of the different innate properties of materials.

Referring to claim 6, 12, 15 and 18, Reber further teaches for example, the use of different mediums such as the coating 14 (and 16) comprises any material that is capable of being patterned to micrometer and submicrometer dimensions so as to diffract incident light.

Exemplary of such materials are metals, such as gold, aluminum, silver, titanium, nickel, tantalum and the like, and dielectrics such as oxides, particularly inorganic oxides such as silicon dioxide, and photoresists. The material may be reflective, such as a metal as described above so as to provide an additional decorative effect arising from the presence of the metal itself, or the material may be transparent, so long as it may be suitably patterned as described above (column 3, lines 27-37). Also, a transparent layer 28 is then deposited over at least the patterned coating 14 on the substrate 10, as shown in FIG. 1d, to form the finished product. Such a layer must be durable in order to protect the underlying coating 14 against scratches, abrasion, etc., and may comprise a transparent oxide, such as silicon dioxide or silica-based glass, or a transparent plastic, such as a polyurethane or a polyimide. The deposition of such materials is well-known (column 6, lines 1-9). The layer 28 is substantially transparent, in order to permit the maximum diffraction effect to be perceived (column 6, lines 16-18). It would be inherent to design a product with differing mediums wherein medium 1 possesses a higher index of refraction than that of medium 2 and manufacture by using different materials according to said design because such traits are desirable in order to trap light in waveguides and fiber optics.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 7-9 and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reber in view of Mersereau et al.

Referring to claims 1, 7 and 19, Reber teaches for example, a product by the method of manufacturing or the method of manufacturing, which provides as depicted in FIG. 1a, a semiconductor substrate 10, here silicon is shown, having formed on one major surface 12 (the front surface) thereof a coating 14. A coating 16 may optionally be provided on the back major surface 18 for aesthetic purposes (column 3 lines 15-19). The coating 14 (and 16) comprises any material that is capable of being patterned to micrometer and submicrometer dimensions so as to diffract incident light. Exemplary of such materials are metals, such as gold, aluminum, silver, titanium, nickel, tantalum and the like, and dielectrics such as oxides, particularly inorganic oxides such as silicon dioxide, and photoresists. The material may be reflective, such as a metal as described above so as to provide an additional decorative effect arising from the presence of the metal itself, or the material may be transparent, so long as it may be suitably patterned as described above (column 3, lines 27-37). Next, the coating is patterned, employing conventional lithographic techniques. While many such techniques are available, electron beam lithography is preferred because it is capable of generating the requisite pattern dimensions. Electron beam technology permits the pattern generation of a mask, using an e-beam resist. The mask is then employed in conjunction with a conventional photoresist layer on the substrate coating to be patterned, with exposure of the masked photoresist, for example, to optical radiation incrementally stepped across the resist-coated wafer. Alternatively, e-beam technology permits the use of direct-writing the desired pattern in the substrate coating (column 3, lines 52-64). Continuing in the description of the process of fabricating the decorative article of manufacture

of the invention employing the mask approach, a photoresist layer 20 is deposited on the coating 14, as shown in FIG. 1a. A positive photoresist, such as Shipley AZ 1350, may be employed, since in such materials, regions exposed to actinic radiation to form the pattern are cross-linked (polymerized) relative to unexposed regions. However, negative resists may also be suitably employed in the practice of the invention. A reticle (not shown) containing the desired pattern is used in the direct step on wafer process to provide regions in the photoresist layer 20 which replicate regions in the reticle. Following exposure to actinic radiation, exposed regions are then removed, such as by a wet process (chemical etching) or a dry process (plasma etching). The removed regions thereby expose underlying portions of the coating 14 through openings 22, shown in FIG. 1b. The exposed portions of the coating 14 are then etched, either chemically, such as with an appropriate acid (metal coating) or solvent (photoresist coating), or with plasma, to generate a relief pattern. The etching advantageously removes material all the way to the surface 12 of the substrate 10, further extending the openings 22, as shown in FIG. 1c. Alternatively, the etching may remove only a portion of the exposed regions, so long as the openings are of sufficient depth such that, in conjunction with the width of the lines 26 thus produced, the relief is of sufficient dimension so as to provide diffraction of incident light. The remaining photoresist layer employed in the lithographic process is removed with a suitable solvent, leaving a patterned series of lines 26 in the coating 14, as seen in cross-section in FIG. 1d and in plan view in FIG. 2 (columns 4-5, lines 43-68 and 1-13). Alternatively, the photoresist layer 20 may be deposited directly on the substrate 10 and patterned as above to form openings 22. The coating 14 may then be deposited over the entire photoresist layer, including the openings 22. Then, employing well-known "lift-off" techniques, the photoresist may be

removed, taking with it the coating filling the openings, thereby providing the patterned coating on the substrate (column 5, lines 14-22). A transparent layer 28 is then deposited over at least the patterned coating 14 on the substrate 10, as shown in FIG. 1d, to form the finished product. Such a layer must be durable in order to protect the underlying coating 14 against scratches, abrasion, etc., and may comprise a transparent oxide, such as silicon dioxide or silica-based glass, or a transparent plastic, such as a polyurethane or a polyimide. The deposition of such materials is well-known (column 6, lines 1-9). The layer 28 is substantially transparent, in order to permit the maximum diffraction effect to be perceived (column 6, lines 16-18).

However, Reber fails to teach a first medium at least partially forming a first layer and a second layer of the optical device, the first layer having a plurality of periodically spaced protruding portions surrounded by concave portions having a depth less than the thickness of the first medium or defining a plurality of periodically spaced concave portions, the concave portions having a depth less than the thickness of the first medium.

Mersereau et al. teaches for example, etching results in the formation of a pattern of notches 25 shown in FIG. 3, and after the etching, the remaining photoresist layer 12 of FIG. 2 is removed. Referring to FIGS. 4 and 8, the pattern of notches 25 may have the shape of interconnected annuli which define an array of cylindrical segments 26 (column 2, lines 40-45).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to provide a product by the method of manufacturing or the method of manufacturing having a first medium at least partially forming a first layer and a second layer of the optical device, the first layer having a plurality of periodically spaced protruding portions surrounded by concave portions having a depth less than the thickness of the first medium or defining a

plurality of periodically spaced concave portions, the concave portions having a depth less than the thickness of the first medium because these characteristics provide optical characteristics which can be obtained for light beams of desired wavelengths and polarization directions.

Referring to claims 2, 8 and 20, Reber further teaches for example, the use of different mediums such as the coating 14 (and 16) comprises any material that is capable of being patterned to micrometer and submicrometer dimensions so as to diffract incident light. Exemplary of such materials are metals, such as gold, aluminum, silver, titanium, nickel, tantalum and the like, and dielectrics such as oxides, particularly inorganic oxides such as silicon dioxide, and photoresists. The material may be reflective, such as a metal as described above so as to provide an additional decorative effect arising from the presence of the metal itself, or the material may be transparent, so long as it may be suitably patterned as described above (column 3, lines 27-37). Also, a transparent layer 28 is then deposited over at least the patterned coating 14 on the substrate 10, as shown in FIG. 1d, to form the finished product. Such a layer must be durable in order to protect the underlying coating 14 against scratches, abrasion, etc., and may comprise a transparent oxide, such as silicon dioxide or silica-based glass, or a transparent plastic, such as a polyurethane or a polyimide. The deposition of such materials is well-known (column 6, lines 1-9). The layer 28 is substantially transparent, in order to permit the maximum diffraction effect to be perceived (column 6, lines 16-18). It is fundamental that the different materials possess different indices of refraction because of the different innate properties of materials.

Referring to claims 3, 9 and 21, Reber further teaches for example, the use of different mediums such as the coating 14 (and 16) comprises any material that is capable of being

patterned to micrometer and submicrometer dimensions so as to diffract incident light. Exemplary of such materials are metals, such as gold, aluminum, silver, titanium, nickel, tantalum and the like, and dielectrics such as oxides, particularly inorganic oxides such as silicon dioxide, and photoresists. The material may be reflective, such as a metal as described above so as to provide an additional decorative effect arising from the presence of the metal itself, or the material may be transparent, so long as it may be suitably patterned as described above (column 3, lines 27-37). Also, a transparent layer 28 is then deposited over at least the patterned coating 14 on the substrate 10, as shown in FIG. 1d, to form the finished product. Such a layer must be durable in order to protect the underlying coating 14 against scratches, abrasion, etc., and may comprise a transparent oxide, such as silicon dioxide or silica-based glass, or a transparent plastic, such as a polyurethane or a polyimide. The deposition of such materials is well-known (column 6, lines 1-9). The layer 28 is substantially transparent, in order to permit the maximum diffraction effect to be perceived (column 6, lines 16-18). It would be inherent to design a product with differing mediums wherein medium 1 possesses a higher index of refraction than that of medium 2 and manufacture by using different materials according to said design because such traits are desirable in order to trap light in waveguides and fiber optics.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Martinez whose telephone number is 703-305-0577. The examiner can normally be reached on T-Th 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 703-308-4883. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7724 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-4883.

September 5, 2002

Hung Xuan Dang
Primary Examiner